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ABSTRACT

A variable rule of /s/ deletion that operates in many varieties of Spanish is examined. A descriptive apparatus is posited that may be helpful in systematizing quantitative data from studies of phonological variability. Empirical data from the speech of informants show that ordering relationships among constraints on variable phonological rules may be quite complex. Factor groups may be ordered on a strength scale by means of a cross-products method. First and second order constraints are illustrated. Factors within a factor group may also be ordered. It is argued that this ordering should be determined on the basis of the relationship of the individual to the group. Three types of constraints are suggested: primary (all individuals conform), secondary (a significant majority of individuals conform), and "statistical" (the group as a whole conforms but individuals vary randomly). It is suggested that this classification also describes certain aspects of the diachronic development of the adoption and spread of a variable rule. (Author/JB)

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Observations on the relationship between group and individual variation in the development of constraints on variable rules: evidence from Spanish

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1. Quantitative studies of phonological variability have multiplied rapidly since Labov's pioneering work with the English of Martha's Vineyard. We are now in a much better position to understand the manner in which phonological change takes place because of these detailed dialect studies. However, on a practical level it is often not easy to make sense of the large quantities of data which may be produced in any normal investigation of phonological variability. The relationship between individual variation and group variation has been particularly intricate and difficult. Guy (1974) in his investigation of final stop deletion in English states the problem as follows:

> On the practical side, there is the problem of trying to reduce this mass of numbers into a manageable, comprehensible form. More substantively, we want to know what it all means, how much of this diversity reflects actual differences between speakers, and how much is due to mere statistical fluctuation and smallness of sample size. Finally we want to know how well the individuals mirror the behavior of the group and vice versa. (p. 27).

In this paper I will examine a variable rule of /s/ deletion which operates in many varieties of Spanish and will posit a descriptive apparatus which I believe will be helpful in systematizing quantitative data from studies of phonological variability.

Wolfram and Fasold (1974) discuss various levels of claims which linguists have been willing to make with regard to the relationship between quantitative analysis and what has been termed "psychological reality." The weakest claim is that human beings are capable of distinguishing between obligatory and optional rules.[1] This is the traditional position and accepted by all linguists as far as I know. A stronger claim, resulting primarily from Labov's work is that a speaker knows which factors favor or impede the execution of a rule in speech. Most researchers working with variable rules have been willing to make an even stronger claim that language users have the ability to learn hierarchical ordering, ie., the relative strength of constraints. I will not discuss the further pos-

sibility that speakers may have the ability to assign "probability factors" to each constraint. (Sankoff and Cedergren, 1974).

The term "constraints" is somewhat ambiguous in that it has been used to refer both to what may be termed a "factor group" and the "values" of the factors within that group. For example, it has been shown that the phonological segment which follows final /t,d/ in English is a constraint on a rule of /t,d/ deletion. The factor group is "segment following" and the values which are significantly different in terms of constraining the deletion rule are (1) consonant, (2) glide, (3) liquid, (4) vowel, (5) pause (Guy, 1974). Another factor group might be labeled "segment preceeding", the significant values of which are (1) sonorant consonant and (2) obstruent consonant.

Wolfram and Fasold illustrate that the ordering of factor groups, if significant, may be established by means of a branching diagram (termed "cross products" by Labov, 1969). They show that "segment following" as a constraining factor group is more important for /t,d/ deletion than is "segment preceeding" and they term former a "first-order" constraint and the latter a "second order" constraint. I will first examine this sort of ordering in terms of some factor groups which constraint the operation of /s/ deletion in Spanish.

2. The phoneme /s/ in some Spanish dialects is variably aspirated (h) and deleted (Ø) in syllable and word final position. These processes are geographically distributed according to certain historical relationships. Aspiration and deletion of /s/ orginated in southern Spanish, probably in the seventeenth century, and spread to the countries of the trade routes, but not to the main capitals of the highlands. Thus, they are favored in countries of the Caribbean (Cuba, Puerto Rico, the Dominican Republic, Panama, Venezuela) as well as most of the coastal areas of the other countries bordering the Caribbean and in southern South America in Argentina, Uruguay, Paraguay, and Chile. Aspiration and deletion of /s/ is not normal for speakers from the interior of Mexico, Colombia, Ecuador, Peru, Bolivia, or northern Spain. Both processes are optional for all speakers who use them. Linguistic and extralinguistic factors control the application of these rules in speech. (Ma and Herasimchuk, 1971, Cedergren, 1973, Terrell 1975b, 1976b, 1976c, 1976d, 1977b, Fontannela de Weinberg, 1973, and Longmire, 1976.)

In this paper I will deal only with the process of /s/ deletion, which affects mainly word final /s/, orthographically 's' or 'z' in words such as los 'the-plural', niños 'children', buenos 'good', vamos 'we go', es 'is', luz 'light', entonces 'then', and so forth. Thus final /s/ is (1) a plural marker, (2) a part of verb forms, or (3) an integral part of some lex-

ical item. In the case that deletion does not apply, speakers choose between a sibilant or aspiration. This latter choice is also governed by linguistic and, especially, extralinguistic constraints.

The constraints on deletion are quite complex internally and in addition vary from area to area. I will limit my discussion to the following factor groups and values:

FACTOR GROUP	VALUES
EA "environment after"	C "preconsonantal" V "prevocalic" P "prepause"
PL-A "plural marker for adjectives"	REDUND "redundant /s/" FIRST "the /s/ of the modifier in the first position of the noun phrase, usually a determiner"
PL-N "plural marker for nouns"	PMN "noun with modifier in preposition" UMN "noun not modified or with modifier in postposition"
LENG "length of word"	POLY "polysyllabic" MONO "monosyllabic"

The relative strength of these factor groups may be established, as suggested, by the use of cross-products tables. The data from the following three cross-products tables will establish the ordering relationships for these factor groups in Argentinian Spanish.

PL-A	EA	%Deletion	EA	PL-A	%Deletion
	C	30%		REDUND	30%
REDUND	P	19%	C	FIRST	8%
	V	10%			
			P	REDUND	19%
				FIRST	3%
	C	8%			
FIRST	P	3%	V	REDUND	10%
	V	3%		FIRST	3%

The "functional" constraint of position within the noun phrase is a stronger constraint on deletion than is the phonological segment which follows /s/.[2]

LENG	EA	%Deletion	EA	LENG	%Deletion
			C	POLY	23%
	C	23%		MONO	5%
POLY	P	7%			
	V	5%	P	POLY	7%
				MONO	0%
	C	5%	V	POLY	5%
MONO	P	0%		MONO	0%
	V	0%			

The factor group, LENGTH is a stronger constraint on deletion than is the phonological segment which follows /s/.

EA	PL-N	%Deletion	PL-N	EA	%Deletion
	PMN	31%		C	31%
C			PMN	P	13%
	UMN	21%		V	8%
	PMN	13%			
P					
	UMN	10%			
				C	21%
	PMN	8%	UMN	P	10%
V				V	5%
	UMN	5%			

The function of the plural marker for nouns, in contrast to that of adjectives is subordinate to the effects of the following phonological segment. In summary then, the factor groups are ordered as follows.[3]

PL-A > EA
Length > EA
EA > PL-N

3. In addition to ordering relationships between factor groups, the values of a factor group may also be ordered

according to their effect on the operation of the rule. However, often there are problems in ascribing significance to the figures which result from a quantitative study of the effects of factors within a group. Given enough cases, almost any difference in number of rule applications can be statistically significant, or on the other hand if the number of cases is low, almost none of the differences will be statistically significant. I will try to show that ordering relationships between factors in a group should be analyzed not just in terms of statistical significance but in terms of the relationship between the variation shown by individual informants and the variation exhibited by the group as a whole. I propose that the relationships be classified in one of three categories:

(1) all of the individuals of a group follow the order constraints.
(2) a significant majority of a group follows the order constraints.
(3) the ordering of constraints is significant for the group, but not for individuals.

I will use the terms primary, secondary, and statistical constraints respectively, to describe these relationships between individuals and the group.

The ordering of the factors of the group PL-A is primary for Argentinian speakers. All informants delete the REDUND /s/ more than /s/ in FIRST position: REDUND (23 ± 4%) > FIRST (6 ± 1%).[4] The ordering of the factors of the group LENGTH is almost primary, only one informant of twenty four did not follow this order: POLY (16 ± 3%) > MONO (3 ± 2%). The factor group EA is more complex. The relationship of a following consonant and a following vowel is primary: all informants delete more before a consonant (21 ± 1%) than before a vowel (5 ± 1%). On the other hand, the order between a consonant and a pause is secondary, 22 of 24 informants delete more before a consonant (21 ± 1%) than before a pause (11 ± 2%). The ordering between a pause and a vowel is also secondary: 21 of 24 informants delete more before a pause (11 ± 2%) than a vowel (5 ± 1%). It is possible that as the rate of application of deletion increases for the population as a whole these secondary constraints may become primary constraints.[5] These relationships are displayed in the following table.

Argentina		
PL-A:	Redundant (23 ± 4%) > FIRST (6 ± 1%)	24/24
LENGTH	POLY (16 ± 3%) > MONO (3 ± 2%)	23/24
EA	C (21 ± 1%) > V (5 ± 1%)	24/24
	C (21 ± 1%) > P (11 ± 2%)	22/24
	P (11 ± 2%) > V (5 ± 1%)	21/24

The ordering constraints of the factors in the factor group PL-N, noun plural marker, is not primary in any dialect studied to date. The data in the following includes the confidence internals at .99 confidence levels.

			.99
CUBA			
UMN	19%	(N= 486)	14%-24%
PMN	39%	(N= 1450)	33%-42%
Informants:	16/18		
PUERTO RICO			
UMN	34%	(N= 478)	28%-40%
PMN	44%	(N= 1559)	41%-47%
Informants:	21/23		
ARGENTINA			
UMN	13%	(N= 1294)	11%-15%
PMN	20%	(N= 1910)	18%-22%
Informants:	18/24		

In all quantitative studies I have done, the practical tactic is to divide the data for a group into as many categories as feasible in order to test for possible constraining factors. In some cases, statistical tests demonstrate that these differences are significant. However, an analysis of the output of each individual informant often does not support this claim to significance.

An example may be found in the treatment of the /s/ of personal pronouns. Confidence intervals applied to the rates of deletion for individual pronouns shows that none of the differences are significant. However, if the pronouns with relatively higher rates of deletion are grouped together, apart from those with lower rates of deletion, the difference is significant at the .90 level of confidence:

ARGENTINA PRONOUNS

	Rate	.90	.99
A. nosotros "we" ellos, ellas "they" vos "you-singular"	17%	13%-21%	11%-23%
B. nos "us" los, las, les "them"	9%	7%-11%	5%-13%

Deletion rates for the monosyllabic object pronouns, nos, los, las, les are significantly lower (at the .90 confidence level) than the corresponding rates for the polysyllabic pro-

nouns nosotros, and ellos, ellas, and for vos. In the latter case although vos is monosyllabic, there is no word in Spanish vo as there are in the cases of nos (no), los (lo), las (la), and les (le) in which some manifestation of the /s/ is crucial for the meaning of the word. However, as logical as this function classification may be, the fact remains that although the difference for Argentinians as a whole is statistically significant, individual speakers do not necessarily follow this system. In fact more speakers deleted /s/ more often in the monosyllabic non-redundant cases than in the polysyllabic or redundant ones. Specifically, only six of the twenty-four informants follow this constraint; another seven delete more often in group B than in group A and eleven of the informants did not delete the /s/ of pronouns at all.

The corresponding data for Cuban informants is completely different.

CUBA PRONOUNS

		Rate	.90	.99
A.	nosotros	85% (N= 121)	81%-89%	77%-93%
B.	ellos, ellas nos los, las, les	20% (N= 248)	16%-24%	13%-27%

All of the Cuban informants delete more in A than in B. The difference between Cuban and Argentinian Spanish may be explicable in terms of the overall rates of /s/ deletion in the two dialects. The rate is much lower in Argentinian Spanish. Thus this "statistical" constraint may be the first indication of some individuals having moved in the direction of adoption of a new constraint which may or may not be adopted by the group as a whole.

Diachronically, it appears that at the adoption of a variable rule, there is random natural phonetic fluctuation at a statistically insignificant level. A few individuals begin to adopt a skewed distribution in terms of favoring (or disfavoring) some contexts for certain variants. If this development in these individuals is strong enough, it may show up as a statistical constraint for the group as a whole. If then enough new speakers learn this constraint, ie., no longer is it simple random natural phonetic variation, then the constraint with time may become a secondary constraint. If the constraint is strongly favored (presumably by means of some sort of sociolinguistic mechanism: prestige of the speakers, etc.) it may develop into a primary constraint.

In summary then, I have presented empirical data from the speech of informants from varieties of Spanish to show that ordering relationships among constraints on variable phonological rules may be quite complex. Factor groups may be ordered on a strength scale by means of a cross-products method.

I have illustrated first and second order constraints. Factors within a factor group may also be ordered. I have argued that this ordering should be determined on the basis of the relationship of the individual to the group, and have suggested three sorts of constraints: primary (all individuals conform), secondary (a significant majority of individuals conform) and "statistical" (the group as a whole conforms but individuals vary randomly). I have suggested that this classification also describes certain aspects of the diachronic development of the adoption and spread of a variable rule.

Notes

1. I am unconvinced that a true phonological rule, ie., not written to account for morphophonemic alteration but for allophonic variation, is ever completely obligatory; what is meant here is that it is obligatory in certain contexts. Thus the aspiration of /p/, /t/, /k/ in English is considered by most to be, at least for all practical purposes, obligatory in word initial position in stressed syllables.

2. See Terrell (1977a) in which I discuss the relationship between phonological and functional constraints on the rule of deletion and the theoretical implication of this relationship.

3. Of the dialects I have studied only in Argentina can the order be established in this manner. In Cuban and Puerto Rican Spanish there does not seem to be any significant variation accountable for in terms of the phonological context. The overall rates of deletion for these dialects are much higher and it is probably the case that as the use of the rule increases and the functional constraints become more and more firmly established, the phonological constraints disappear or at least weaken considerably. See Terrell, 1976a.

4. The rate of application is reported in terms of "statistically significant intervals" at the .99 confidence level. The formula used is $p \pm 2.58\sqrt{\frac{p\ (1-p)}{n}}$ where n= total number of cases and p= proportion in which the rule has applied. Any statistics manual may be consulted with regard to the use of confidence intervals.

5. On the other hand, given the situation in more advanced dialects of little or no effect of the phonological context, it is not clear that these must become primary before they are lost.

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